HEPATOPATHY WITH RENAL OXALOSIS IN THE BOVINE FETUS

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Introduction

Pathognomonic lesions are rarely found on gross necropsy examination of aborted bovine fetuses. Common but nonspecific findings are subcutaneous hemorrhagic edema, serosanguinous fluid in all body cavities and perirenal hemorrhage. In addition, infection with certain bacterial agents such as *Vibrio fetus* will produce a fibrinous exudate on the liver and serous membranes, while pinpoint necrotic foci in liver and spleen may be a feature of *Listeria* abortion (3). Fetal hepatopathy, or the presence of a large, swollen, coarsely nodular liver, is most frequently associated with epizootic bovine abortion (EBA). First described by Howarth in California in 1956 (1), this condition is the result of a chlamydial infection. Other characteristic gross changes of EBA are subcutaneous edema, ascites and generalized petechial hemorrhages (2, 6). The presence of this infection in the province of Saskatchewan has not been definitely confirmed to date. This report describes a syndrome encountered in Saskatchewan in which gross fetal lesions similar to those of EBA were found.

Materials and Methods

All bovine fetuses or fetal tissues submitted to the Provincial Veterinary Laboratory, Regina, Saskatchewan from July 1, 1973 to April 30, 1974 were included in this study. A total of 539 cases were examined.

Necropsy examination

Routine necropsy examination and collection of tissues for cultural and microscopic procedures were performed. If available the abomasal contents were submitted to the diagnostic bacteriology laboratory. Portions of lung, liver, spleen and kidney were frozen for virological studies. Sections of lung, liver, spleen, myocardium, kidney and thymus were fixed in 10% neutral buffered formalin for histological studies. Gestational age of the fetuses, when not definitely known, was estimated by measurement of the crown-rump length and appreciation of such characteristics as haircoat formation as described by Roberts (8).

Microbiological examination

Routine cultural procedures for isolation of pathogens such as *Brucella* spp., *Vibrio* spp. and mycotic agents were conducted in all cases. No special techniques were undertaken for chlamydial isolation.

Histological examination

Formalin fixed tissues were processed routinely, embedded in paraffin, sectioned at 6 μ and stained with hematoxylin-eosin (H & E). Sections of kidney were examined under polarized light for the detection of refractile oxalate crystals.

Results

Twenty-two cases out of a total of 539 fetuses or fetal tissues examined exhibited the large, pale, nodular liver described as characteristic of EBA. The gestational age of the affected calves ranged from four to eight months, with the majority (12 animals) estimated at six months gestation. Ten submissions were from farms reporting single abortions; the remainder were from farms on which two or more abortions had occurred. In one case two animals submitted from the same farm had identical lesions.

Gross necropsy findings

Obvious abdominal distention and edema of the ventral midline and legs was found in all cases in which the entire fetus was available. A large amount of clear yellow to dark red fluid was present in abdominal, thoracic and pericardial cavities. The liver was enlarged, pale and nodular in appearance with a distinct lobular pattern and rounded borders (Figure 1). The consistency was firm to fibrous. In five cases the thymus was noticeably smaller than expected.

Histological findings

Sections of liver from all cases revealed marked separation of hepatocytes with homogenous eosinophilic material in the sinusoids. There was an increased amount of fibrous connective tissue in the organ, varying from mild

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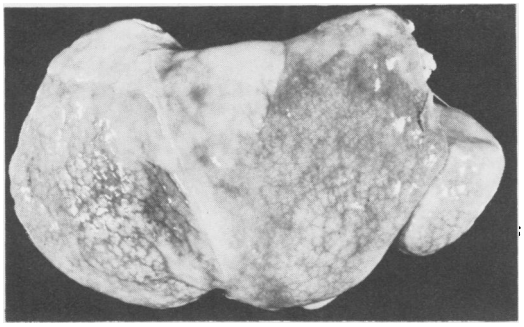

FIGURE 1. Fetal liver showing nodularity with distinct lobular pattern.

thickening of the perivascular areas to marked generalized interstitial fibrosis. Bile duct hyperplasia was noticeable in three fetal livers. Kidney was available for study in 21 of the 22 cases. In all of these the renal tubules contained large numbers of sheaf-like refractile crystals which were most easily appreciated under polarized light. These crystals were assumed to be oxalate crystals as previously described (9). In five of the nine cases where thymus was present for examination, the cortical area was depleted of lymphocytes. There was no evidence of a specific inflammatory response in the tissues examined; nor were the classical focal granulomatous lesions described for EBA found in heart, liver, spleen or thymus.

Microbiological findings

None of the common infectious causes of abortion were identified in the 22 cases involved.

DISCUSSION

A large, pale, swollen, coarsely nodular liver has been described as primarily characteristic of infection with chlamydial organisms resulting in the condition known as EBA (2,6). Similar gross lesions can be produced in the postnatal animal by chronic passive congestion due to organic cardiac disease or congenital heart defects (4, 12); ingestion of toxic plants or agents (5); and nutritional deficiencies of compounds such as cystine and choline (10). In the 22 cases described above in which this liver change was present, there was no microscopic evidence of chlamydial infection. None had gross cardiac defects or microscopically detectable changes in the myocardium and vessels. The ingestion of toxic plants or primary nutritional deficiencies in the dam resulting in fetal lesions could not be excluded from consideration.

Oxalate crystals were identified in the kidneys of 21 fetuses with liver lesions; however crystals were also found in 119 fetuses in which hepatopathy was not present. The presence of oxalate crystals in bovine fetal kidneys has recently been described with a metabolic disturbance suggested as the underlying mechanism (9).

Although the pathogenesis of the condition described in this paper has not yet been determined, one might speculate that an undetected vascular abnormality such as coarctation of the aorta or other vascular malformations could have produced the hepatic lesions. The consistent presence of renal oxalosis could suggest that intrauterine oxalosis may predispose the fetus to vascular malformation or circulatory disturbance. Oxalate crystals have been described as deposited in vascular walls (7, 11, 13, 14), and have been incriminated as the cause of peripheral gangrene due to vascular obliteration (1).

SUMMARY

Twenty-two bovine fetuses from 539 cases of abortion in Saskatchewan during the period from July 1, 1973 to April 30, 1974 exhibited large, pale, nodular livers similar to those described in cases of EBA. Oxalate crystals were present in large numbers in the renal tubules. The cause of the hepatopathy was not determined; however the possibility of infection with the chlamydial agent responsible for EBA was ruled out on histological examination.

RÉSUMÉ

L'auteur a effectué l'étude de 539 cas d'avortements bovins survenus en Saskatchewan, entre le 1er juillet 1973 et le 30 avril 1974. Il nota que le foie de 22 avortons était hypertrophié, pâle et bosselé, comme dans les cas d'avortement épizootique bovin. Les tubules rénaux de ces avortons contenaient aussi de nombreux cristaux d'oxalate. Il ne réussit pas à préciser la cause de cette hépatopathie; l'histopathologie lui permit cependant d'éliminer la présence du *Chlamydia* auquel on attribue l'avortement épizootique bovin.

ACKNOWLEDGMENTS

The technical assistance of members of the Provincial Veterinary Laboratory staff, the case material provided by Dr. R. Kelly, Regina and the advice of Dr. B. Schiefer, Department of Pathology, Western College of Veterinary Medicine, Saskatoon, Saskatchewan are gratefully acknowledged.

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RÉSUMÉ

Observations des mycoplasmes chez les bovins en Alberta 1969–1972. E. V. Langford (Anim. Dis. Res. Inst., Lethbridge, Alberta).

De 1969 à la fin de 1972, l'auteur procéda à la recherche de mycoplasmes dans un ou plusieurs tissus de 2,381 animaux. Ces échantillons provenaient de 1,953 bovins, 332 moutons, 30 porcs, 25 sujets d'espèces différentes et 41 cultures tissulaires. Les tissus examinés comprenaient: les poumons, le lait, l'endomètre, le mucus vaginal, les cotylédons, l'estomac de fœtus, les lavages du prépuce, les articulations, le pis, le cerveau, ainsi que des écouvillons oculaires et nasaux d'animaux malades ou sains.

Comme milieu de culture initial, il utilisa le bouillon de Hayflick contenant des substances inhibitrices. Au bout d'environ quatre, huit ou 18 jours, il transféra à la gélose de Hayflick, pourvue, elle aussi, de substances inhibitrices. Il procéda à l'isolement des souches T à l'aide du bouillon à l'urée de Shephard, avec transferts sur la gélose à l'urée de Shephard. En plus des milieux déjà mentionnés, il utilisa le milieu de Gourlay en vue d'isoler *Mycoplasma dispar* des poumons.

Les méthodes qu'il utilisa pour identifier les souches incluaient: l'épreuve de l'inhibition de la croissance, semblable à la méthode décrite par Clyde, et/ou la technique d'immunofluorescence, semblable à celle qu'a décrit Al Aubaidi, avec illumination conventionnelle ou épi-illumination.

Il isola un ou plusieurs mycoplasmes d'un total de 468 animaux ou cultures tissulaires. Les souches isolées et identifiées à date sont les suivantes: *M. bovigenitalium, M. laidlawii, M. bovirhinis, M. agalactiae* var. *bovis, Mycoplasma* spp Type 7 de Leach, *M. arginini, M. oculi* et des souches T, chez les bovins; *M. conjunctivae* et *M. arginini*, chez les moutons. Il n'a pas encore complété l'identification des souches isolées des autres animaux et des cultures tissulaires.

Les Séances de Recherche du 25e Congrès Annuel de l'Association canadienne des vétérinaires, Edmonton, Alberta 1973.